1995090411_LPS

Mission Summary

950904I (NOAA-43RF) Vortex Motion and Evolution Experiment (VME)

Scientific Crew:

Lead Project Scientist Radar Scientist Dropwindsonde Scientists Workstation Franklin Marks Goldenberg, Samsury Leighton

Mission Briefing:

At 0900 UTC on 04 September, Hurricane Luis was located at 17.0N, 57.4W, moving towards 265 degrees at 11 kt, with maximum estimated sustained winds of 120 kt and a minimum sea level pressure (MSLP) of 940 mb. The short term forecast was for continued westward motion.

The VME mission called for both NOAA aircraft to fly coordinated, pre-determined flight patterns, collecting flight-level, Doppler radar, and Omega dropwindsonde (ODW) data within 160 nm of the center of Luis. Planned takeoff times were 2100 UTC for N43RF, and 2130 UTC for N42RF, to allow both aircraft to reach their respective initial positions (IPs) at 2200 UTC. The takeoff times were also set to ensure that the ODWs would be released after local sunset, when Omega signal propagation quality improves. At the projected IP time, Luis was forecast to be at 16.9N 59.9W. Estimated IP locations were 16.9N 57.11W for N43RF, and 14.73N 59.9W for N42RF. The VME pattern was to be rotated relative to the pattern in the HRD Field Program Plan, such that N43's IP would be east of the center, and N42's IP would be located south of the center. In addition, changes were made to the specific ODW channel frequencies to accomodate the particular distribution of sondes available.

Two other key logistical changes to the nominal pattern were made. First, the length of N42's legs was changed from 40 to 45 nm, to allow better coordination with N43, in the event that N43's penetrations were lowered from 18000 ft PA to 14000 ft PA. A secondary reason for this change was the large (40 nm diameter) eye of Luis. And second, it was decided that the two aircraft would attempt to coordinate the times of each true-dual-doppler (TDD) leg, not just the ones beginning at the coordination points (CP) A, B, and C.

Mission Synopsis:

The mission began with N43RF's takeoff from Barbados at 2108 UTC. By 2142 UTC the aircraft had reached an altitude of 19 kft PA (483 mb). The IP (160 nm E of Luis, 17.2N 57.3W) was reached at 2205 UTC, where the first ODW was released. The sun had not quite set, and the ODW did not work. At 2214 UTC a backup ODW was released. At a position roughly 100 nm east of the center the second scheduled ODW was released (2219 UTC). An excellent radar presentation allowed good coordination of CP "A", which was reached at 2228 UTC. The center of the 40 nm wide eye was reached at 2238 UTC, and N42 was clearly visible below. A partial cloud deck between the two aircraft was also visible. The first TDD leg ended at 2249 UTC, and drop 3 was made at 2252. Drop 4 was made early (2259 UTC), on the downwind leg, to avoid a rainband. The second TDD leg began 50 nm S of the center at 2301 UTC and ended at 2321 UTC. Drop 5 was delayed slightly to wait for a relative clear spot.

N43RF then headed outbound to a point 160 nm NNE of the center, releasing ODW #6 at 100 nm radius (2335 UTC). This ODW was backed up 2339 UTC. At 2348 UTC the aircraft turned west, made another drop, and headed to a point 160 nm NNW of the center. This point was reached at

0017 UTC. The aircraft turned inbound (track 150) and made drop #8. This drop was backed up at 0023 UTC. Drop #9 (0032) was delayed about 20 nm because of difficulty finding a good sonde. CP "B", the start of the third TDD leg, was reached at 0039 UTC, and the center was marked at 0051, with a 1 kt wind. This pass was perfectly coordinated with N42. Unfortunately the radar system froze at 0051 UTC, and the tail radar was not brought back up until 0103, three minutes after the TDD leg ended (drop 10, 0100 UTC). The downwind leg ran from 0100-0113, when the fourth TDD leg began (track 240) and drop 11 was made. N43 marked the center at 0126 UTC, only 1 minute ahead of N42, which again was visible below. The TDD leg ended at 0136, when N43 turned to a point 160 nm W of the center, and drop 12 was made.

On the outbound leg, drop 13 was made at 0144 UTC 100 nm W of the center. A this point, the aircraft climbed to 21 kft PA (445 mb). At 0200, the aircraft turned towards the SSE headed to a point 160 nm SSW of the center. At 0227, the aircraft turned inbound (track 030) at made drop 15. Drop 16 was made at 0238, and the aircraft descended back to 19 kft PA. CP "C", the start of TDD leg #5, was reached at 0248. Coordination on this TDD leg was perfect, with both N42 and N43 marking the center at 0259 UTC. Once again, the radars froze in the eye, however. By 0303 the radars were running again. The TDD leg ended at 0309, when drop 17 was made. A downwind leg ensued from 0309-0321 UTC, and drop 18 was made. By this time, the eye appeared to have shrunk somewhat to 32 nm diameter. The last TDD leg (track 120) began at 0321, with the center marked at 0332 UTC. Three minutes later, N42 marked the center. The TDD leg ended at 0342. On the final outbound leg, drops 19,20, and 21 were made at 0343, 0356, and 0411 UTC, ending the pattern. After drop 19, the aircraft climbed to 21 kft PA. N43RF recovered in Barbados at 0440 UTC.

Mission Evaluation and Problems:

Overall: Outstanding. The second consecutive successful VME experiment demonstrates that this pattern is viable for future hurricane field programs. The Doppler and ODW data surpass the Iris data set in quality. In addition, we now have successful VME data sets in two hurricanes of very different intensities. This should allow us to test how vortex steering varies with dynamic characteristics of the inner core.

Aircraft coordination: Outstanding. Changing N42's legs to 45 nm, and coordinating each TDD leg will be made a permanent part of the pattern.

Radar: Good enough. There were four significant outages: 0011-0021, 0051-0059, 0258-0303, and 0356-end. These outages destroyed TDD legs 3 and 5. Fortunately, at least one of each pair of TDD legs was successful.

ODWs: ODW performance was very good. All the sondes on the outer two rings wither worked or were successfully backed up. Preliminary evaluation of the real-time ODW printouts follows. PTH failures are not considered mission-critical. For winds, failure of inner-ring ODWs are not considered mission-critical unless middle ring ODW also fails and doppler targets are not present along that radial. Some of the missing data may be obtainable from N42 or recoverable in postprocessing.

Winds	
OK	OK below 750 mb
OK	OK
Fail	Fail
OK	OK
Fail below 750 mb	Fail below 850 mb
	Winds OK OK Fail OK Fail below 750 mb

6	Fail	Fail
6b	OK	OK
7	OK	OK
8	Fail	Fail
8b	OK	OK
9	OK	OK
10	Fail below 600 mb	Fail below 600 mb
11	Fail	Fail
12	Fail below 700 mb	Fail
13	OK	OK
14	OK	OK
15	OK	OK
16	OK	OK
17	Fail below 750 mb	Fail below 750 mb
18	Fail	Fail below 700 mb
19	Fail	Fail below 650 mb
20	OK	OK
21	OK	OK

Workstation: 8 ODW messages and 6 lower fusilage composites were transmitted. This mission is very demanding on the workstation, and it is virtually impossible to get out all the desired messages with only one keyboard/terminal.

James Franklin

E.2.1 Preflight

- 1. Participate in general mission briefing.
 - 2. Determine specific mission and flight requirements for assigned aircraft.
- Determine from CARCAH or field program director whether aircraft has operational fix responsibility and discuss with AOC flight director/meteorologist and CARCAH unless briefed otherwise by field program director.
 - Contact HRD members of crew to:
 - a. Assure availability for mission.
 - b. Arrange ground transportation schedule when deployed.
 - c. Determine equipment status.
- 5. Meet with AOC flight crew at least 90 minutes before takeoff, provide copies of flight requirements and provide a formal briefing for the flight director, navigator, and pilots.
 - 6. Report status of aircraft, systems, necessary on-board supplies and crews to appropriate HRD operations center (MGOC in Miami or FGOC at remote recovery location).

E.2.2 In-Flight

- 1. Confirm from AOC flight director that satellite data link is operative (information).
- 2. Confirm camera mode of operation.
 - 3. Confirm data recording rate.
 - 4. Complete Form E-2.

E.2.3 Postflight

- Debrief scientific crew.
- Report landing time, aircraft, crew, and mission status along with supplies (tapes, etc.) remaining aboard the aircraft to the appropriate HRD operations center (MGOC or FGOC).
- Gather completed forms for mission and turn in at the appropriate operations center. [Note: all data removed from the aircraft by HRD personnel should be cleared with the AOC flight director.]
- Obtain a copy of the 10-s flight listing from the AOC flight director. Turn in with completed forms.
 - 5. Determine next mission status, if any, and brief crews as necessary.
- 6. Notify the appropriate operations center (FGOC or MGOC) as to where you can be contacted and arrange for any further coordination required.

Form E-2 Page 1 of 5

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C.

Date 950904	I Aircraft 43	3 Fligh	t ID
Participants			
	HRD	-18-	0A0
Function	Participant	Function	Participant
Lead Proj. Sci.	FRANKLIN	Flight Director	DAMIANO
Cloud Physics		Pilots	PHILIPSBORNE/OM
Radar	MARKS	Navigator	STRONG
Workstation	LEIGHTON	Sys. Engr.	
Photographer		Data Tech.	LYNCH
Omenanda	COLOSIDEDI/CANE.	204 El Tech	WE WILL GAL
Omegasonde	GOLVENSEKS/ SAMSI	El. lecn.	MUMICUMIA
AXBT/AXCP	GOLVENBERGISAMS	Other	MUNICUNA
Omegasonde AXBT/AXCP Take-Off 2409 Past and Foreca Date/Time	Location Locations Latitude Long	Ditude MSLP	Location Max. Wind

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Form E-2 Page 5 of 5

Lead Project Scientist Event Log

Date 9509041

Flight _

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Time	Event	Position	Comments	
0103	TAIL BACK			
0114	DIO PARTIAL	D11 @ 0115	D11 N.G.	
0125	MOONLIT	EXE - 42 VI	SIBLE-	BOXY
013506	D12 BAD			EYEWALL
614423	DI3 OK			
0150 -	6000 BAND -	BEST BUMPS OF TH	EFUGHT - WOF	
022823	D15	OK		
023827	D16	JUST BEFORE B	AND	
0243	PRISCEND TO	19 4ft D14, 15,	16 @ 21 Kft	
0248	CPC		·	
025805.	- RADAR STOPPE	DURING PASS -	UBH LEG N.G.	
	(FRALLEG. QUE	BTIOMABLE		
030311	BACKON -	IN EVENALL	LOTOF LE	EVE STRETCHES
032349	D18 -	eye about 32	miles ?	CONV.
0313	DIG Then	dub to 2119t	PARTIAL	(~ 25 MILES
N0345	KADAR OUT			
035602	DZO			
0440	LAND.			

Form E-2 Page 4 of 5

Hurricane Recco Plotting Chart

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True at 25° Latitude, in Degrees and Minutes



Note: Label full degrees according to location of flight area.

Form E-2 Page 4 of 5

Hurricane Recco Plotting Chart

True at 25° Latitude, in Degrees and Minutes



Note: Label full degrees according to location of flight area.

Form E-2 Page 5 of 5

Lead Project Scientist Event Log

Date 950904 I

Flight _

LPS FRANKLIN

Time	Event	Position	Comments	
2103	T/0	13'04' 59'30'	BARBADOS	
2133	FERRY TO I.P.	This ferry 15 Ver	tually an extra orta 4	ą!
2142	REACH YB3 MB -	19 kft)
2205	IP	1712 5718	DROP @ 220732~	
221331	BACKUPOFD	ROP1 _ BACK	IP SEEMS OK - DI	
2228	ĊP A	17 13 59 01		
2233	ILE ON INBOU	ND - OUTSIDE ETE	WALL ~ 5 MILES - BIG CEL	5
2236	INTO THEEVE	N 40 MILE EVE		
-2238 -	CAN SEE 42 -	PERFECT COOR	DINATION - SOME CLDS BE	TW US \$42
2243 -	SOME ECE IN	W EYZWALL		
225130~	D3 - NO SIG	NAL FROM SON	DE - FAIL	
225912	MADE DY EAS	LY TO AVOID BAN	Gu	
2315	ICE IN NE	HEWALL	6000 COORDINATION	
232826	DELAYED DS	FOR RELATIVE C	SEAR	
2335	06 BAD -	BACKUP OIL		
2350+9	D7 OK			
2356	STELMO'S OF	E BDOM		
2246	DE BAD	BACKUP 002328	OK	
003138	D9 - DROPU	AS LATE - LOULD	NTFIND GOSONDE IN T	'nÊ
00-1550	NW EXENAL	- ICE MOKA	- RUUGH RIDE	
0051	FIX-1ET-	PERFECT COORd	nation	
007 350	NW EYEWAU FIX-1KT-	PERFECT COORD	- KUVGH MDE mation	

S 005102 RADAR FROLE - IN EVE S 005533 RADAR BACK - 2059 DUTSIDE EQEWALL - TAIL STUL OUT LF



VORTEX MOTION AND EVOLUTION EXPERIMENT



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Fig. 1 Upper A/C Flight Pattern

950904I LUIS VHE